People with Intellectual Disabilities at Risk of e-Exclusion

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1 Abstract

In our digital era, computers are used for education, leisure activities, communication and social life. Hence, possessing or not possessing the basic skills to operate a computer undoubtedly has an impact on one's social life. The risk of digital exclusion is especially true for those individuals with limited mental capabilities. In this paper, we present a framework that can be used for training and assessing the ICT skills of youngsters with mental disabilities. Based upon the test reports, additional material is provided to train specific skills and improve the use of the computer. The test environment is attractive for the envisioned target group, while the test is compatible with the ECDL system and with several local educational systems.

2 Introduction

More and more, ICT skills (the basic skills to operate a computer) are becoming a gateway to today's world of education, entertainment, business and social life. People not possessing the skills that enable them to enter this world, are likely to be excluded from the information society. In particular this is especially true for people with intellectual disabilities. The disparity will even grow when current and future ICT advances are not adapted to be accessible for those individuals, leading to further isolation and economic disadvantage. On the other hand, making these technologies available in a transparent way will contribute to full inclusion of individuals with disabilities in the mainstream of society[1]. Several reports stress the profound influence of having Internet access and ICT skills for social, economical and cultural development on different target groups[2][3]. Unfortunately there is a considerably small number of research and publications referring to the use of ICT by mentally disabled people and their exclusion from the information society. Booy & Vanbruggen[4] have revealed that individuals with a disability consider ICT and internet as a real gateway to the rest of the world. The advantage for those individuals of possessing ICT skills is hence twofold: as a gateway to the world *and* as a rehabilitation tool.

In our previous project WAI-NOT[5][6], we could confirm this. The possession of ICT skills interferes with other concepts that are frequently associated with quality of life and empowerment, such as:

- Participation in society;
- Relations with others;

- Proficiency, independency, choice and control;
- Empowerment;
- Respect and appreciation.

3 Envisioned Goals

Research conducted in the scope of the EasyICT project[7] showed that there is almost no attention put to the structures and/or methods supporting the acquisition of ICT skills by persons with mental disabilities. This is why the estimation of the needs is still purely empirical. Within an international consortium, field research based on formal and informal interviews and observations was conducted in Belgium, Poland, Turkey, Austria and Italy. This identified three types of needs in special education of young people with intellectual disabilities: (1)the need of an educational system supporting the use of ICT; (2)an educational system able to assess acquired ICT skills and (3)having educational guidelines and tools to train ICT skills of their teachers and pupils.

The aim of the EasyICT project is to formalise the training and assessment of ICT skills for the envisioned target groups.

3.1 Target Group Definition

We take Rowland's classification of mental disabilities[8] as a starting point for defining our target group. In this classification functional disabilities are considered as more important, regardless of the clinical background of the individual. Table 1 enumerates four important cognitive functions and their indicator areas with respect to ICT skills. For each functionality, we show how the person's capabilities can be assessed.

Cognitive function	**Indicator areas**	**Profiling Methods**
Memory	• Sensory memory • Working memory • Long term memory	• Recall previous input • Recall instructions • Recall structure of a sequence
Literacy	• Reading skills • Writing skills • Multimedia skills	• Speed and fluency of writing and reading • Understanding of words, meanings, and icons • Input efficiency
Attention	• Focused attention., • Sustained attention • Selective attention	• Navigation skills • Time used on tasks • Keep focus • Response time • Orientation • Sustained attention during session
Problem	• Reasoning • Calculations	• Handling of error messages • Task solving approach

solving	• Handling of error messages • Use of help	• Navigation skills • Use of help function

Table 1: classification of cognitive disabilities

EasyICT aims at a very broad group of youngsters (age 6 to 18), not excluding those who need assistance to perform a task. The level of assistance is included in the assessment, but may vary during time. Table 1 presents a good starting point to clarify the EasyICT final target group. This classification is used as a reference for further specification of the minimal skills that are required. These minimal requirements can be assessed with or without assistance of a coach.

- For memory functions, we may expect a minimal ability to understand, memorise and reproduce basic instruction and structures after adapted training.
- For reading, writing and multimedia skills a minimal ability to understand adapted computer interfaces and/or communications in the form of easy-to-read language or pictograms, as well as the ability to respond to messages by performing required actions using selection, activation, writing text and/or using pictogram(s).
- Concerning attention, individuals must be able to focus long enough to perform minimal tasks that give any kind of positive results in using ICT.
- For problem solving, persons must be able to detect a problem and call for help from an assistive person.

Based upon the minimal abilities, we distinguish 3 major target groups:

- Youngsters with intellectual disabilities, having the skills as described above without assistance from a coach. The youngster can perform simple tasks on a computer in an independent way, performing tasks that they have learned. They will only need assistance when unexpected events occur.
- Youngsters with intellectual disabilities, having the skills as described above, with occasional assistance from a coach. The coach will monitor the youngster and help out when requested. One coach can monitor a group of several youngsters at the same time.
- Youngsters with intellectual disabilities, having the skills as described above, but with permanent assistance from a coach. The coach is permanently present and will help in a one to one relationship.

3.2 ICT Skills Definition

In most countries the teaching of several ICT skills are deeply embedded in the regular scholar systems, already starting from primary education. The definition of these skills can be very high-level such as “being able to present information in a multimedia way, using ICT” or “being able to search for, process and save information using ICT”[9]. In the EasyICT-project, we rather focus on the “basic instrumental and procedural knowledge” people need in order to achieve the

higher-level goals. These include the skills that are necessary in order to handle ICT-equipment in a relevant context.

A broad number of ICT-skills certification concepts exist in Europe. CEPIS, the Council of European Professional Informatics Societies, published a study in 2005, reporting 106 e-skills certification systems[10]. Only a few of them are being widely applied in their corresponding countries. ECDL[11] and Microsoft certification are the most often quoted by stakeholders and experts.

In this project we focussed on a framework that fits into the local educational models and is compatible with the ECDL. ECDL today already offers basic computer skills certification for people with disabilities. The expected ICT skills level is the same as for people without disabilities, but the assistive technology and other support that is provided to achieve certain tasks can differ according to the disability. However, basically the tasks performed are the same as for non-disabled people. Nevertheless, today ECDL does not offer any assessment scheme for ICT skills of people with intellectual disabilities. While ECDL sets a global standard for everyone, EasyICT will set personal achievements, based on the individual skills and abilities.

In order to define what we will cover by "basic instrumental and procedural skills", we have set up focus groups, consulted literature and interviewed teachers and coaches of people with intellectual disabilities (n=45). Thereafter, the ECDL methodology was used to create a skills syllabus, to create test questions and to set up test procedures taking into account the special focus on youngsters with intellectual disabilities and the aim for an individual learning path.

ICT skills are categorised in 4 main groups:

1. **Managing the computer:** The candidate can start up and turn off the computer, ask for help if required, use the essential functions of mouse and keyboard, understand and execute simple text messages on the screen and manage windows on the screen.
2. **Browsing the Internet:** The candidate can use the essential functions in a browser, manage browser windows and browse to specified pages.
3. **Using e-mail:** The candidate can start up a mail application, write and receive a mail.
4. **Using ICT to communicate in a safe, sensible and appropriate way:** The candidate can use the hardware in an appropriate way and is aware of viruses, possible misuse of personal information and basic ergonomic aspects. The candidate can call for help whenever needed.

For illustration purposes an extract of a skills breakdown of group 1 (Managing the computer) is given in Appendix A. For each of the skills one or more questions are created.

4 Online Testing Tool

An online environment has been created, which can be used to assess the individual ICT skills of children and adolescents with intellectual disabilities. Tests are always performed in one-to-one set-up with a tutor and one candidate. In general, candidates are able to use their own familiar PC, but if for some practical

reason a different PC has to be used, adaptations have to be made to come as close as possible to the familiar environment (system software, browser, adapted hardware, etc.). Effort was taken to make the test as enjoyable as possible keeping the target users in mind (using nice drawings, colours and sounds).

Three types of tests are identified:

1. *Simulation test questions*: these tests include actions such as clicking and dragging with the mouse. Whenever possible, the test is performed in a simulation exercise (Flash).
2. *'In-application' tests*: these tests include actions such as 'opening the browser'. The tutor will be instructed to leave the software platform and invite the candidates to perform the action on their familiar desktop.
3. *Permanent evaluation tests*: some items are permanently evaluated. The tutor will observe the candidate on particular actions (such as appropriately handling the hardware) and take note of that during a longer observation period.

Figure 1: Example of an exercise

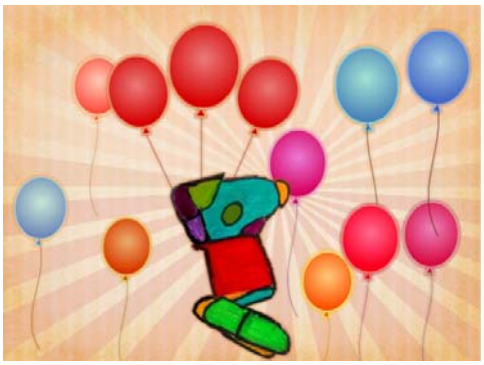

Figure 2: Example of a reward animation

Figure 1 shows an example of a simulation question. The picture represents a drawing of a clown with a moving body. The children are asked to point the cursor to the nose (which is in a fixed location), and hold it steady for 10 seconds. When the candidate succeeds, positive feedback is given by a nice animation, as shown in Figure 2.

There is no time limit to complete an exercise or test, however, to avoid loss of concentration, each session should not exceed 1 hour. The tutor can re-enter the exercise or test situation at any later time. In order to allow the test to bring a positive message to the candidate, the tutor will only select those tests that the candidate will most probably be able to answer. In a later test, or after a training period other or more tests may be selected. Immediately after the test, a certificate is provided for the candidate, listing all the skills that have been assessed positively. Keeping a positive message in mind, skills that have not been achieved yet, or those not tested, are not listed.

For the tutor, the candidates' profile is generated based upon the test results. This profile lists the acquired skills as well as the ones not yet acquired (see **Figure 3**). In addition, a report is generated with a list of additional training materi-

als that can be used for further development of the connected ICT skills. The provided list consists of publicly available online exercises found on the Internet. In Belgium, a collaboration was established between EasyICT and WAI-NOT[5] [12]. WAI-NOT is a portal, especially designed for young people with intellectual disabilities, presenting news items, games, learning materials, music, stories, movies and more. Everything is designed specifically for the envisioned target groups. Based on the candidate's EasyICT profile, a selection is made from the material present in the WAI-NOT.be website and is put at the disposal of the tutor.

Figure 3: Report for the tutor

5 RESULTS

A test phase, evaluating the aforementioned framework and online tool has been conducted during the period May - December 2009. 150 children and 38 tutors, recruited in five European countries participated in the test. As can be seen from **Error! Reference source not found.** figure 4, most of them were teacher in special education.

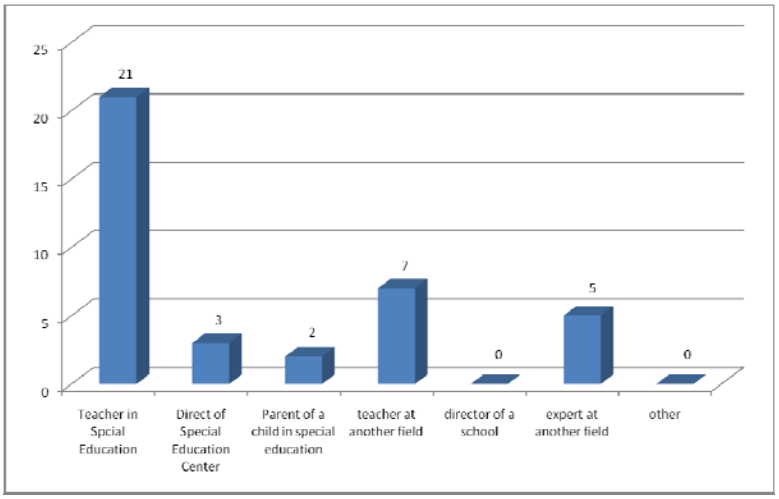

Figure 4: Background of the participating tutors

The 150 children performed a total of 680 test sessions. For eight children with an average profile, a complete test was re-applied in order to check retest consistency. We found a correlation of 0,92 between the first and second results. Differences were found in the results on the use of e-mail.

Next, a questionnaire was held among the tutors, inquiring several topics. Table 2 gives a summarized overview of the different questions per topic and the degree of agreement among the tutors.

Topic	Example Question	% agree
Validity of the content	e.g. all aspects are covered by the testing tool	79%
Validity of the structure	e.g. integrity between parts of the testing tool	92%
Usability	e.g. easiness of usage	88%
Discernibility	e.g. discrimination between individual differences	89%
Objectivity	e.g. questions are understandable	92%

Table 2: results of a questionnaire among the tutors

From the questionnaire, tutors also reported some areas for improvement, such as the fact that the testing platform is not enough self-explanatory, causing teachers new to the platform to get lost in setting up the test. Other remarks address some missing or too complicated functionalities.

From the observations during the test we can draw the following conclusions:

We observed that most children were enthusiastic and enjoyed the tests, being curious what the next exercise would bring. Even when tasks were difficult, they kept on trying to achieve the goal. On the other side, however, we found that a training/evaluation period of 30 minutes (instead of 60 minutes defined before) is sufficient, after which attention starts to reduce.

When the children receive their certificate, we observe two possible reactions: either they are very happy and proud, or they appear indifferent because they don't really understand what this certificate means.

6 Conclusions and Future Work

For individuals with mental disabilities the possession of ICT skills is essential to participate in the digital era. In this paper, we reported on the creation of a framework built upon literature research, focus groups and field research. The aim is to train and assess basic ICT skills for people with mental disabilities in a structured and unified way. The conducted research has been implemented in an online testing tool, which has been evaluated during 8 months in a pilot study. We found that the children were enthusiastic to participate with the tests and liked the environment. The results also showed a very high re-test consistency.

Moreover, considering the subjective impressions of the tutors, we found that most of them are enthusiastic about the offered tool.

Currently, there are concrete plans to apply the EasyICT framework in practice within the "ICT for you" research project, which is identifying necessary ICT competences of tutors and coaches working with people with intellectual disabilities.

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9 APPENDIX A

An example breakdown of the questions under skills group 1: Managing the computer

Group 1: Manage the computer		
1.1	Basic computer operations	
	1.1.1	Identify the computer screen.
	1.1.2	Identify the mouse (or alternative input device for the mouse).
	1.1.3	Identify the computer.
	1.1.4	Identify the keyboard.
	1.1.5	Identify the CD/DVD drive.
	1.1.6	Identify the printer.
	1.1.7	Turn on the computer.
	1.1.8	Shut down the computer correctly.
	1.1.9	Recognise the internet browser icon or menu item on the desktop and start up the browser.
	1.1.10	Recognise the text editor icon or menu item on the desktop and start up the text editor.
	1.1.11	Recognise the trash icon on the desktop.
	1.1.12	Ask a coach for help is the computer does not start up.
1.2	Use the mouse	
	1.2.1	Hold the mouse steady.
	1.2.2	Move the mouse within the entire screen area.
	1.2.3	Move the mouse between two points.
	1.2.4	Click the mouse once.
	1.2.5	Double click the mouse.
	1.2.6	Use the scroll wheel.
	1.2.7	Click the right mouse button and return to the left mouse click.
	1.2.8	Point the mouse at an object.
	1.2.9	Select a specific object with the mouse.
	1.2.10	Double click a specific large object.
	1.2.11	Select, drag and drop an object anywhere
	1.2.12	Select an object, drag and drop it at a location.
1.3	Use the keyboard	
	1.3.1	Recognise different keys on the keyboard.
	1.3.2	Use the Enter and/or Return key when required
	1.3.3	Activate and deactivate the CapsLock key.
	1.3.4	Use the Arrow-keys
	1.3.5	Use the @-key.
	1.3.6	Use the SpaceBar.
	1.3.7	Use the Shift key.
	1.3.8	Use the Delete key (if available).
	1.3.9	Type a simple word.
	1.3.10	Type a simple number.
1.4	...	
	1.4.1	...